REMARKS

Claims 96, 98-103, 105-107, 109, 110, 113, 114, 118, 119, 121, 123-133, 136-140, 142-162 and 168-192 are currently pending.

Claims 99-102, 105, 106, 127-131, 133, 136-140, 142-162 and 168-190 are currently withdrawn.

Claims 96, 106, 109, 110, 113 and 191 are amended by the present amendment.

Claims 97, 104, 108, 111, 112, 115-117, 120 and 122 are canceled by the present amendment.

Claims 96, 98, 103, 107, 109, 110, 113, 114, 118, 119, 121, 123-126, 132, 191 and 192 remain pending and rejected.

Claim Amendments

Claim 96 has been amended to incorporate the recitations of claims 104 and 108 and claims 104 and 108 have been canceled. Claims 106, 109, 110, 113 and 191 have been amended to reflect the change in dependency based on the incorporation of claims 104 and 108 into claim 96. Entry and consideration of the claim amendments is respectfully requested.

Art Rejections

Claims 96, 98, 107 and 191 stand rejected under 35 USC § 102(b) as being anticipated by ABE (USPubN 2002/0051741). Applicants traverse this rejection.

Claims 114, 118, 119, 132 and 192 stand rejected under 35 USC § 103(a) as being unpatentable over ABE. Applicants traverse this rejection.

Claims 103 and 123-125 stand rejected under 35 USC § 103(a) as being unpatentable over ABE in view of Takahashi (USPN 5,746,985). Applicants traverse this rejection.

Claims 109, 110, 113 and 121 stand rejected under 35 USC § 103(a) as being unpatentable over ABE in view of Taguchi (USPN 6,972,119). Applicants traverse this rejection.

Claim 126 stands rejected under 35 USC § 103(a) as being unpatentable over ABE in view of Takahashi and Hoecker (USPN 6,615,588). Applicants traverse this rejection.

ABE does not anticipate or render obvious the presently claimed invention for at least the following reason:

- according to ABE, the heating function and the catalytic function are separated, whereas in the presently claimed reaction chamber at least one porous conductive lining material which defines as a whole or in part a reforming catalyst an electrical source adapted to generate an electronic flux in the specifically claimed conductive lining material.

ABE teaches that the heating and the catalysis are provided by separated units. See, e.g., <u>ABE</u>, paragraphs [0016] to [0029] and FIG. 2 (shown below).

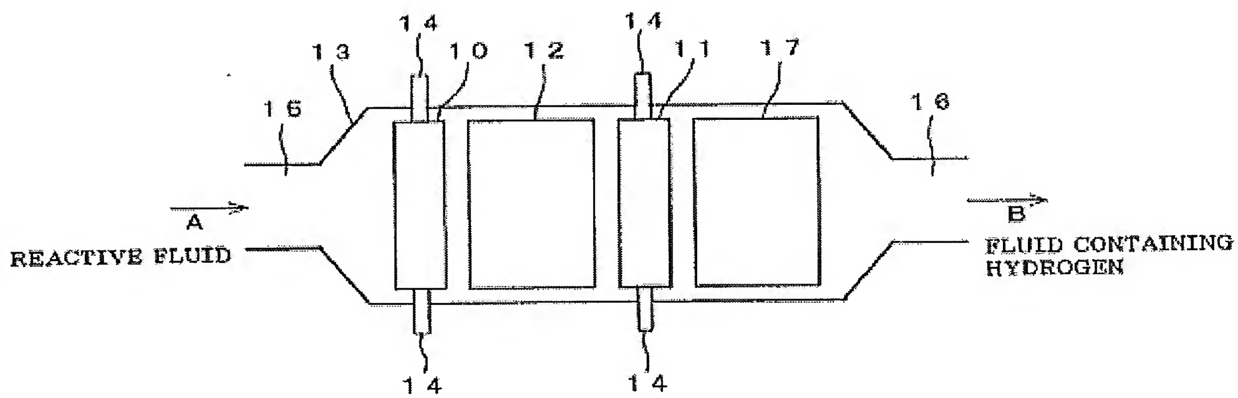

FIG. 2 of ABE shows:

- 10 and 11 are heating units comprising a honey comb structure;
- 14 are electrodes;
- 12 and 17 are catalytic units also comprising a honeycomb structure supporting a catalytic material; and
- 13 is an enclosure.

Thus, it is clear that ABE teaches that the heating units (10, 11) have electrodes (14) and that the heating units (10, 11) are separate from the catalytic units (12, 17).

In addition to the above teachings, ABE specifically emphasizes reasons why the heating units and catalytic units are different units, such that one skilled in the art would be expressly taught away from modifying ABE to have the heating unit and the catalytic units combined. See, e.g., ABE, paragraphs [0053] to [0055].

In ABE, both the heating and the catalysis are based on use of a honeycomb structure. See, e.g., ABE, paragraphs [0090] to [0093]. As the Office recognizes, ABE discloses that the honeycomb structure of a heating unit may also be loaded with a catalytic material. ABE, paragraph [0093]. However, even in this case, a

reformer according to ABE has at least one separate catalytic unit which does not act as a heating unit, and there is no electron flux through the separate catalytic units.

Further, in contrast to an embodiment of ABE wherein the honeycomb of the heater in loaded with catalyst, the presently claimed invention recites that the heating and catalysis are provided by the same entity, ***which is the lining***.

ABE discusses the catalysts used in paragraphs [0083] to [0085]. Therein, ABE teaches that the metal catalysts are loaded onto a heat resistant oxide in the honeycomb structure. ABE teaches that the heat resistant oxide has a high specific surface in order to have a catalytic material with high specific surface providing high catalytic activity. A specific surface of 5-300 m^2/g is preferred and it is stated in paragraph [0085] that a specific surface lower than 5 m^2/g results in a reduced activity.

In addition, in the prior art [See for instance Gates et al, Chemistry of Catalytic Processes, McGraw-Hill Book, 1979, p. 238, copy enclosed for the Office's convenience] catalysts are prepared by impregnating small amounts of metal on a porous support having high specific surfaces (about a few m^2/g to more than 250 m^2/g.

In the presently claimed invention, the specific surface of the lining (which is the catalytic material) may be much less than 5 m^2/g. The presently claimed lining is a rough material in the form of fibers or granules or other geometrical forms. See claim 96 ("the conductive lining material is in a form selected from the group consisting of straws, fibers, filings, frits, balls, nails, threads, filaments, wools, rods, bolts, nuts, washers, chips, powders, granules and perforated plates.") and

paragraphs [0117] and [0264] of the specification. These shapes are completely different from a fine powder dispersed on a porous honeycomb substrate.

According to the prior art teachings, and as understood by one skilled in the art at the time of the claimed invention, it is not obvious that such "low specific surface" material, such as, for example, a rough material in the form of fibers or granules or other geometrical forms would be efficient as a reforming catalyst.

As an example, calculation of the specific surface of a lining steel wool used as the lining in Example 1 of the present Specification is given hereunder.

Relying on the definition of steel wool given in Maskalick (USPN 4,447,509), "[e]specially suitable steel wool is grade 1/0 steel wool, which is available in the form of a long sheet of intermingled, randomally [sic] oriented fibers. These intermingled fibers are relatively smooth and may exceed 1 inch in length. Excellent results have been had with steel wool fibers about 1 inch long having a diameter ranging from about 0.0002 inch to 0.014 inch and a carbon content of about 0.08%. The average diameter of the 1/0 grade of steel wool fibers is 0.001 inch." Maskalick, column 3, lines 36-44.

Thus, 0.0002 inch and 0.014 inch correspond respectively to 5.08 μm and 356 μm with a mean value of 0.001 inch = 25.4 μm.

The ratio « surface/volume » S'_f of a long filament having a diameter d can be calculated by $S'_f = 4/d$.

If steel wool is represented by fibers having a mean diameter of 25 μm (0.001 inch), $S'f = 4/(25*10^{-6}) = 160{,}000\ m^2/m^3$.

If the specific weight of iron is 7.88 g/cm^3 = 7.88*10^6 g/m^3, the surface by weight unit is 0.02 m^2/g of metal which is much lower than the lower acceptable limit mentioned by ABE (5 g/m^2).

A steel wool having a filament diameter at the smallest end of the range has a diameter of 5 µm and would have a specific surface of 0.5 m^2/g of catalyst which is still much lower than the minimum of 5 g/m^2 taught by ABE.

It thus appears that the claimed lining used in the present invention is not suggested by the prior art as an appropriate catalyst for reforming. That is, one skilled in the art would be taught away from using a conductive lining material, which defines as a whole or in part a reforming catalyst, that is in a form selected from the group consisting of straws, fibers, filings, frits, balls, nails, threads, filaments, wools, rods, bolts, nuts, washers, chips, powders, granules and perforated plates.

Further, the presently claimed invention recites that there is an electron flux through the lining, and that the lining acts as a catalyst. The electron flux is essential to maintain a chemical and a catalytic activity for the lining, as is mentioned in the specification of the present application in paragraphs [0133] to [0137] and [0263] of the PG Publication (USPubN 2006/0124445).

The electrical current has two purposes: it activates the lining as a catalyst and it provides the energy required for the chemical reaction. This is not suggested by ABE, or by ABE in view of the other references cited in the Office Action.

Experiments have been made, which show that a lining made of a course metal material such a steel wool has a high catalytic activity when it is submitted to an electron flux, compared to the same material without an electron flux. The

experiments were made as follows (at the Office's request, the following can be provided in the form of a 37 CFR § 1.132 Declaration):

Reforming of methane in the presence of CO_2 in order to produce a gas comprising Co and H_2 was made in a reactor similar to that which is described in Example 1 of the present application.

The CO_2 gas flow was adjusted to the 6.25 cm^3/s and the CH_4 gas flow was adjusted to 4.17 cm^3/s. An electrical current was applied through the lining and interrupted from time to time. A gas sample was taken each time immediately before and immediately after current interruption and was analyzed. Table 1 summarizes the operating parameters, and Table 2 summarizes the gas composition for each sample.

Table 1

Sample n°	Time (min)	Voltage (V)	Current intensity(A)	Resistance (Ohm)	Power (W)	Temp (°C)
4	186	2.19	140	0.0156	307	761
5	189	--	--	--	--	761
6	290	2.23	154	0.0145	343	776
7	294	--	--	--	--	776

Table 2

Sample no	H_2 (%)	CO (%)	O_2 (%)	CH_4 (%)	CO_2 (%)
4	24.06	45.51	0.24	11.68	18.51
5	2.24	9.12	0.25	36.85	51.54
6	25.26	46.63	0.25	11.55	16.31
7	3.96	13.85	0.39	35.33	46.48

Comparison of samples 4 and 5 taken from the reformer just before and after interruption of the current, and samples 6 and 7 taken from the reformer at another moment just before and after a further interruption of the current clearly show the unexpected influence of the electron flux through the liner.

It is therefore clear that the art referenced by the Office, alone or in combination, does not teach or suggest the presently claimed invention wherein a reaction chamber is provided with at least two electrodes and disposed inside the enclosure, said reaction chamber comprising at least one porous conductive lining material which defines as a whole or in part a reforming catalyst, the conductive lining material being electrically insulated from a metal wall of the enclosure so as to prevent any short-circuit; and an electrical source adapted to power up the electrodes in order to generate an electronic flux in the conductive lining material between the electrodes, wherein the conductive lining material is selected from the group consisting of elements of group VIII of the periodic table (CAS numbering) and alloys containing at least one of said elements, and wherein the conductive lining

material is in a form selected from the group consisting of straws, fibers, filings, frits, balls, nails, threads, filaments, wools, rods, bolts, nuts, washers, chips, powders, granules and perforated plates.

There is no reason on record why one skilled in the art would modify ABE, independently or in view of the art of record, to arrive at the claimed invention. Withdrawal of the outstanding art rejections is respectfully requested.

Conclusion

For at least the reasons stated above, the Examiner is respectfully requested to reconsider and withdraw the outstanding rejections and objections, and to allow the present application.

In the event that there are any questions concerning this amendment, or the application in general, the Examiner is respectfully urged to telephone the undersigned attorney so that prosecution of the application may be expedited.

The Director is hereby authorized to charge any appropriate fees under 37 C.F.R. §§ 1.16, 1.17 and 1.20(d) and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 02-4800.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

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